CiC Life First - Walk the Talk

DfS in Temporary Works

19 March 2025

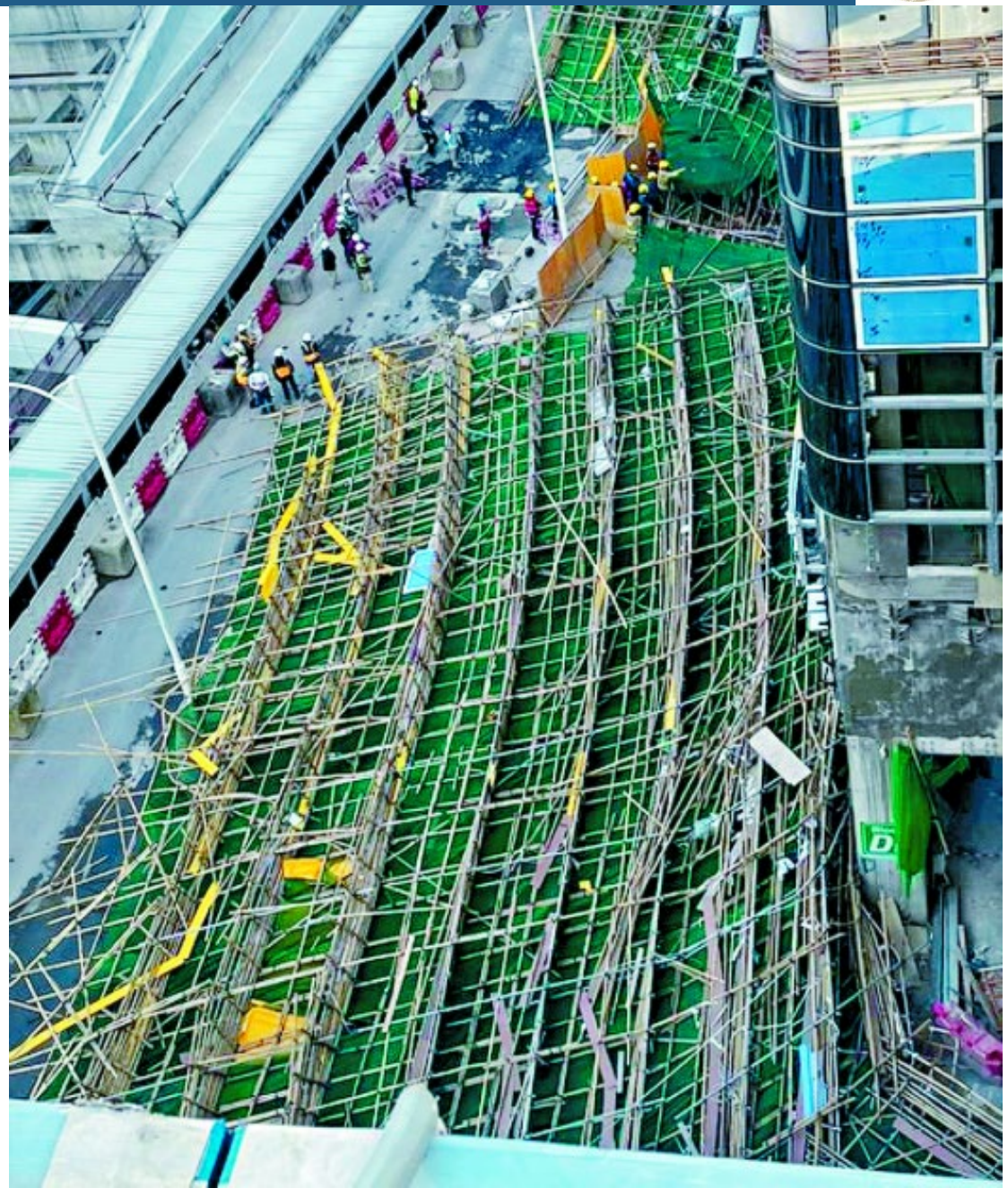
Hong Kong – Temporary Works forum (HK-TWf)
香港 – 臨時工程論壇

TW Failure

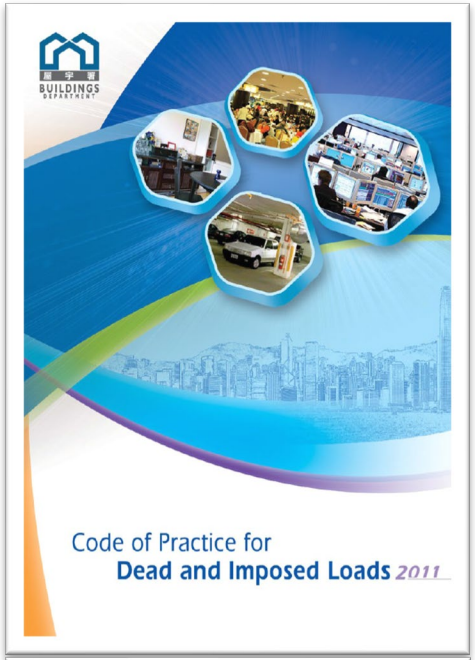
- 肇事工字鐵長3.82米、闊0.4米、高0.32米，重886公斤
- 因先拆承托工字鐵的「U Channel」，工字鐵在拆除期間下墜壓斃下方1名工人
- 精進有制定施工方案，但現場沒有木方、鏈式吊索及滑輪；三判依成沒向工人傳遞施工方案

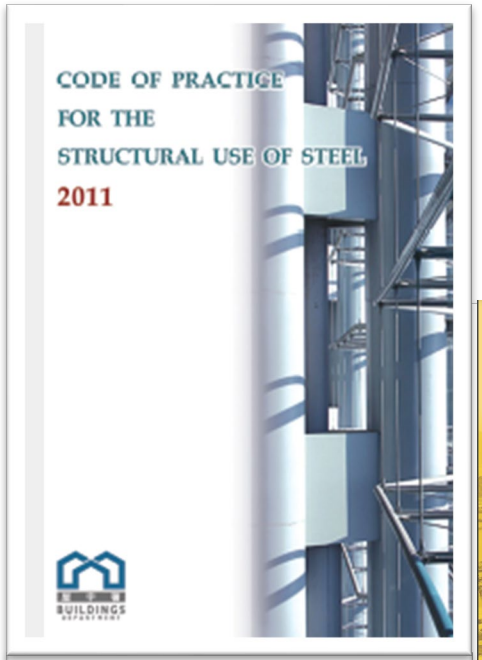
2024.10.31

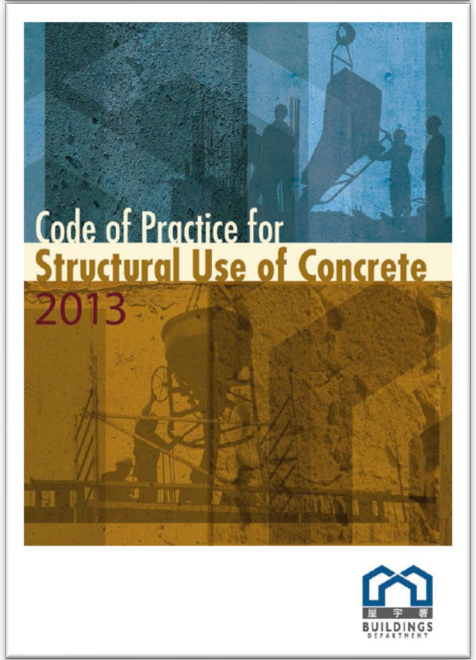
TW Failure

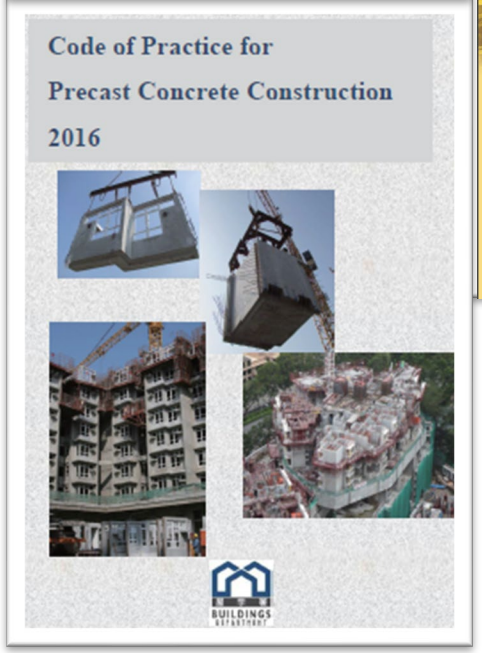


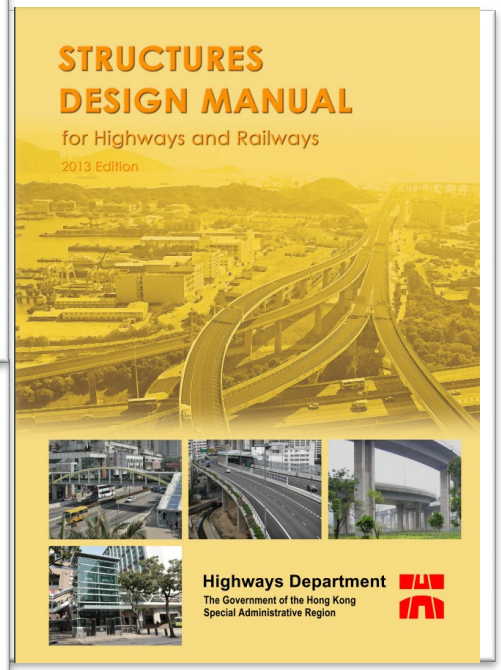
Permanent Works Design Information











HKIE THE HONG KONG INSTITUTION OF ENGINEERS 香港工程師學會

屋宇署 BUILDINGS DEPARTMENT

The Institution of Structural Engineers

ice

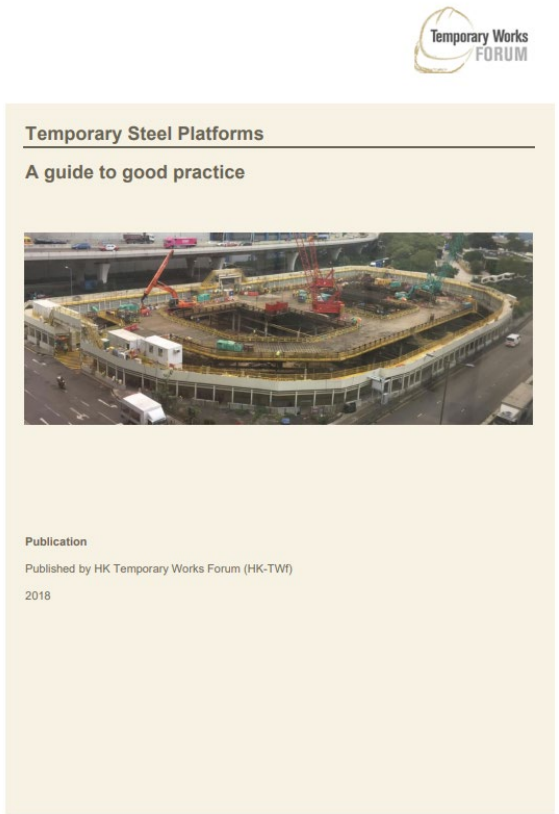
Code of Practice for Temporary Works Procedures

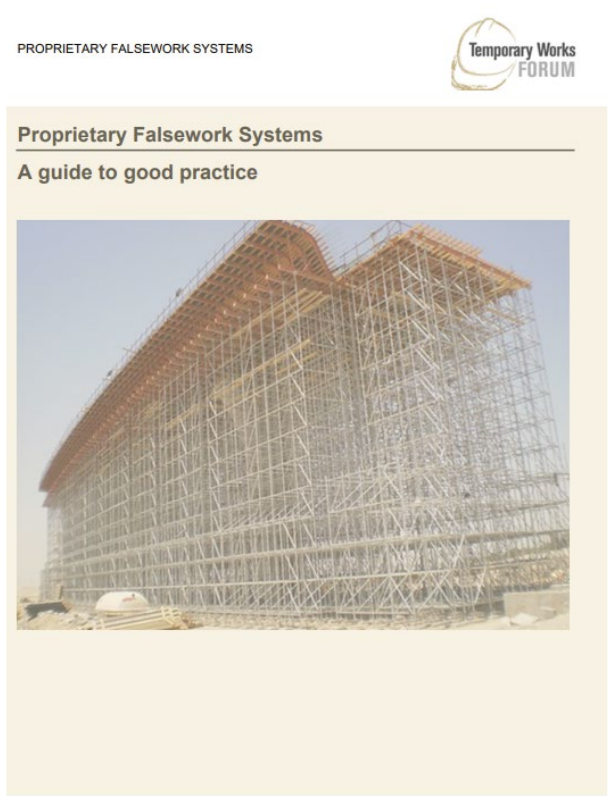
- TW Procedures
- BS5975

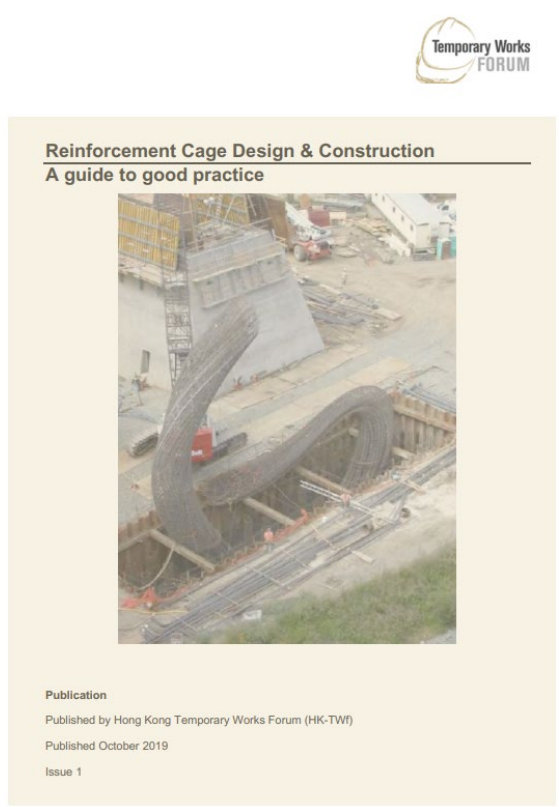
Temporary Works Forum HK

http://www.twforum.org.hk

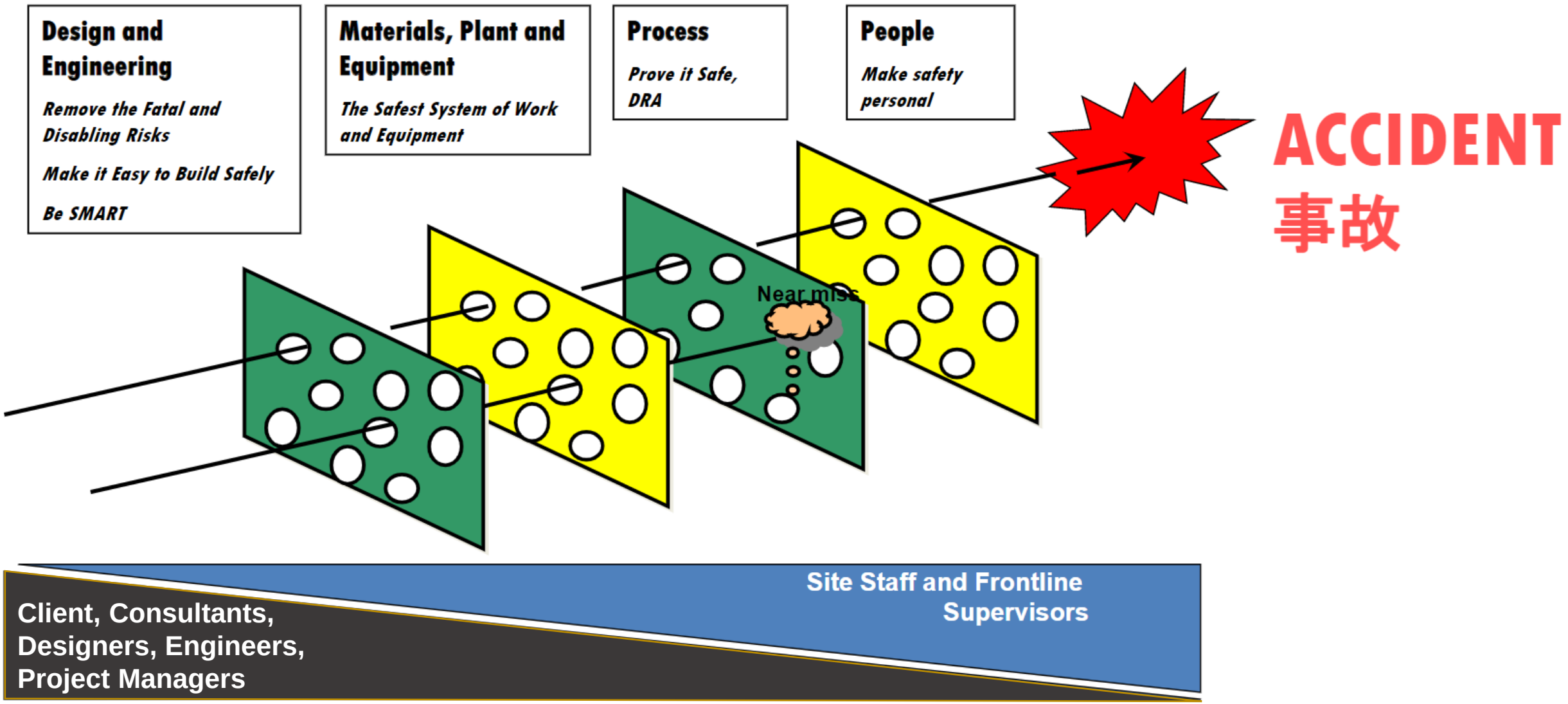
Temporary Works Forum Hong Kong
Civil Engineering • hong kong







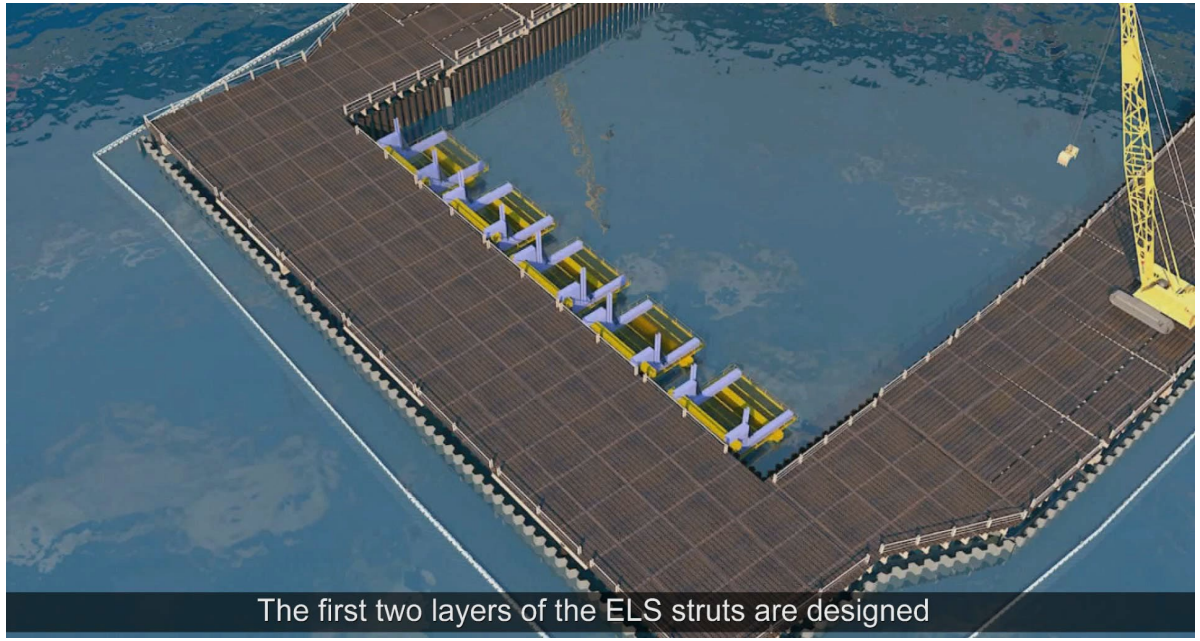
Swiss Cheese Models



Industry Mindset

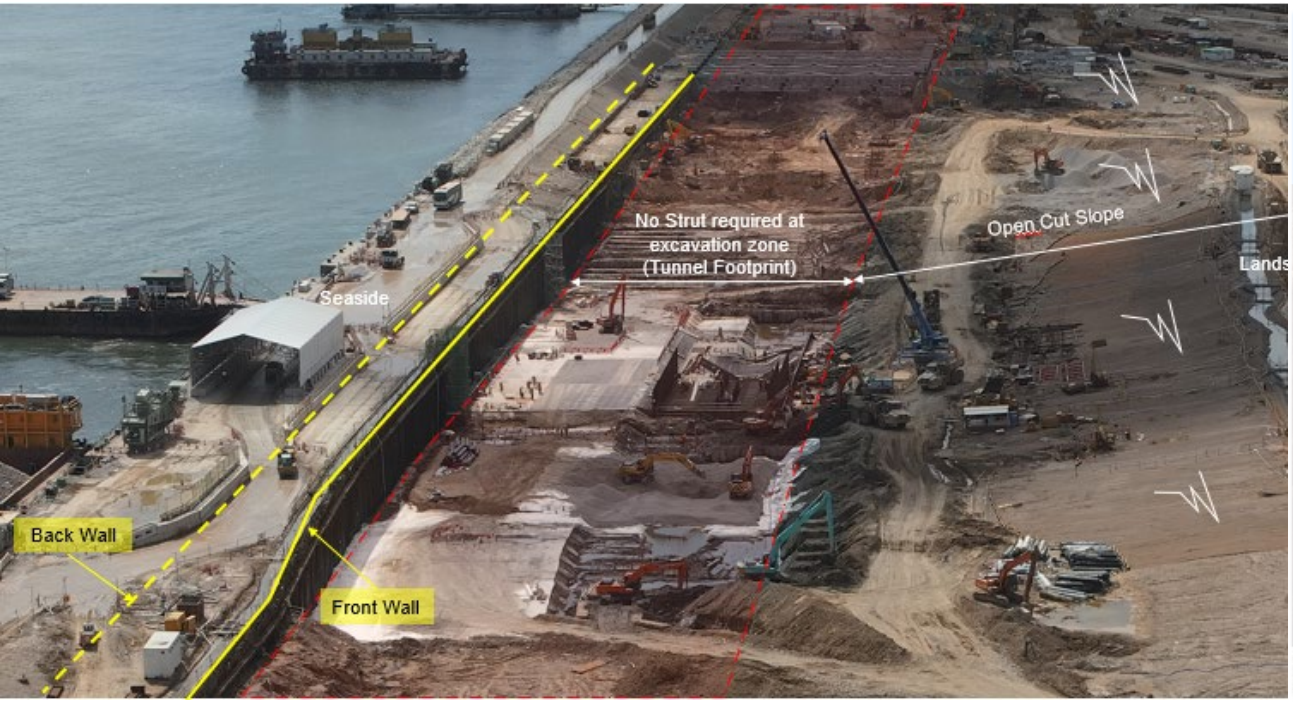
Industry Mindset

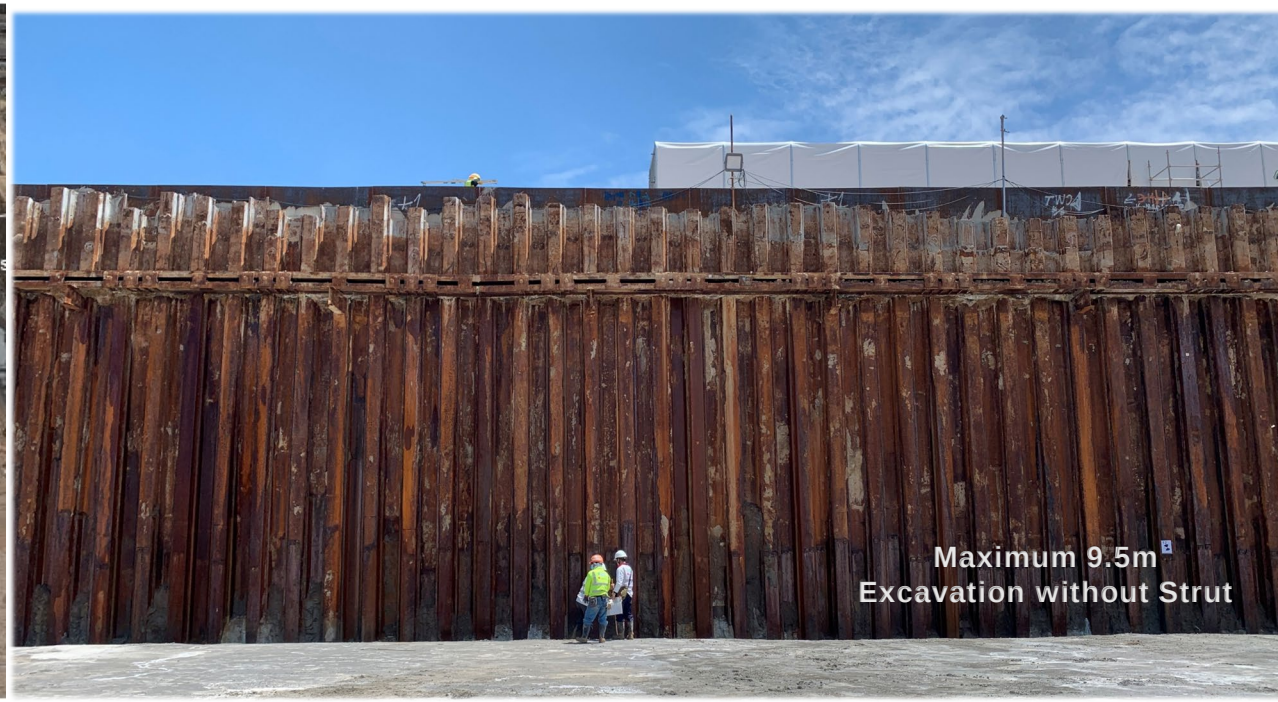
DfS on TW: Innovative Engineering - Making it Easier to Build



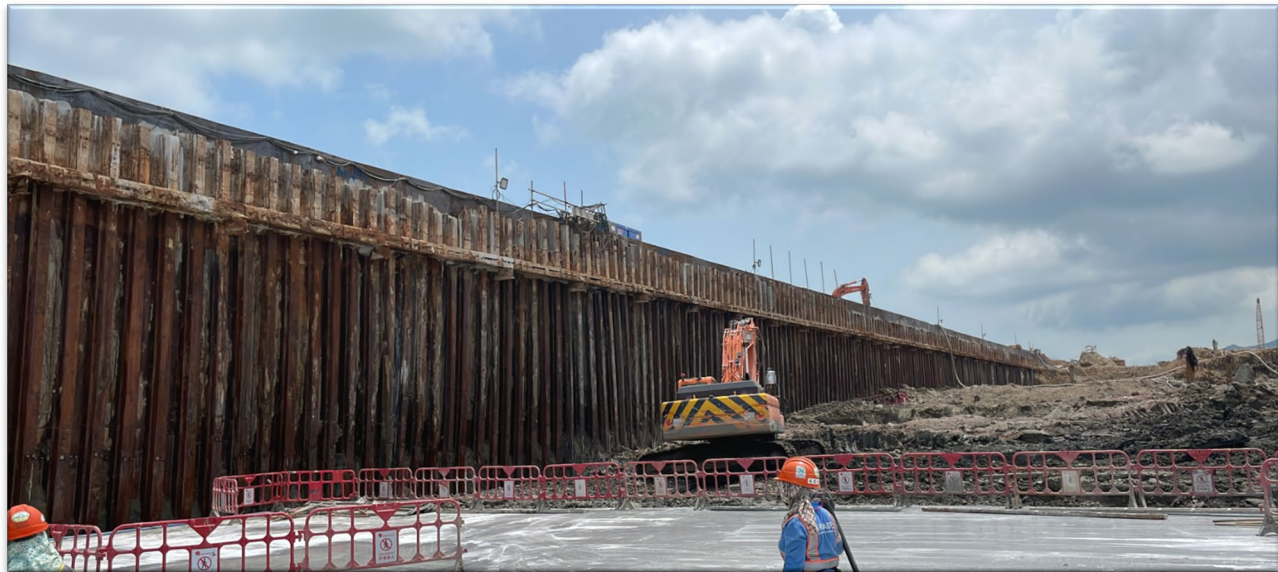
- DfMA – Reduce risks; Like a factory – repeated operations in a safe & controlled manner
- No welding. No working at height. No working above water
- Saving of hiring pontoons & lifting plants
- Environmental friendly
- Resolved technical issues
- Re-Use of Modular ELS

DfS on TW: Innovative Engineering - Making it Easier to Build

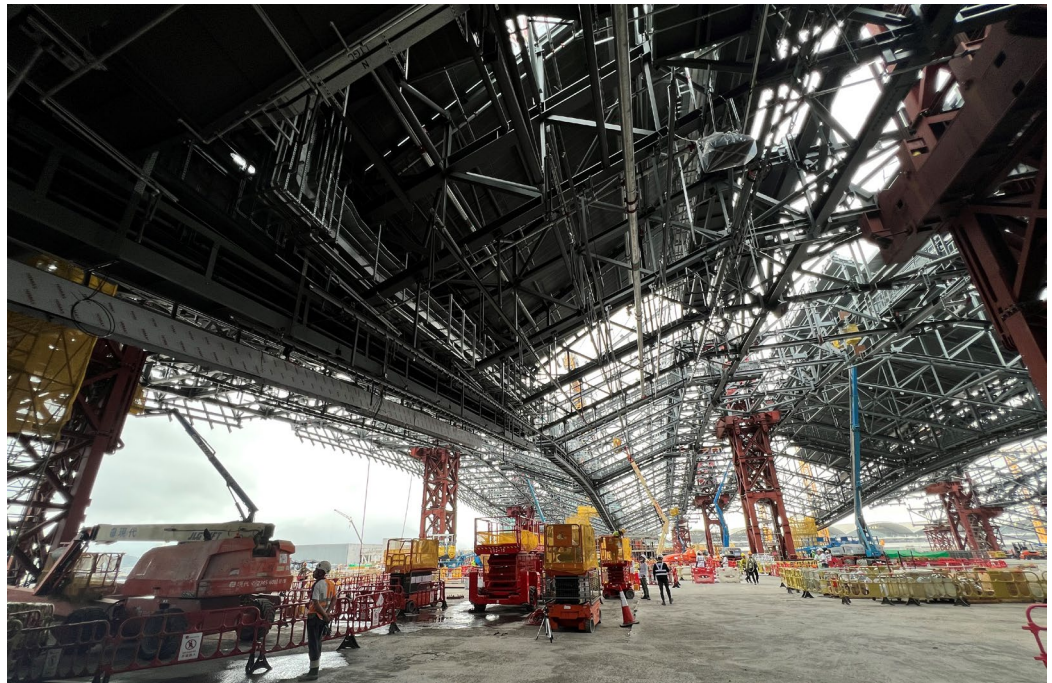




- Open Working Space
- Simple Site Logistic
- More cost effective
- Time saving
- Reduced / Eliminated Safety Risk

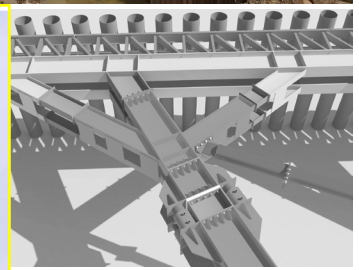


DfS on Temporary Works – MMC, DfMA

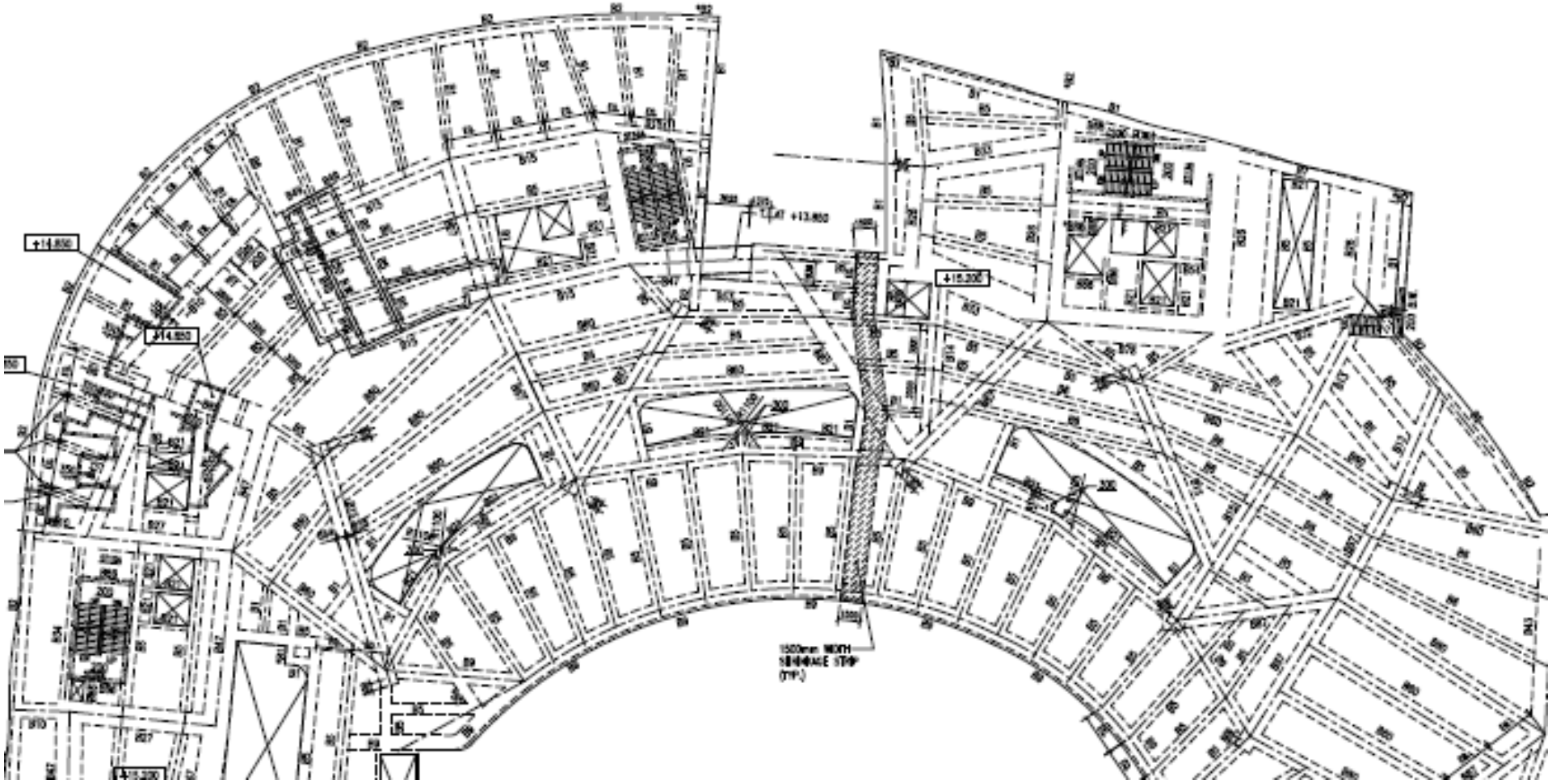


DfS on Temporary Works – MMC, MiMEP & MiC

DfS on Temporary Works – Standardization, Modular ELS



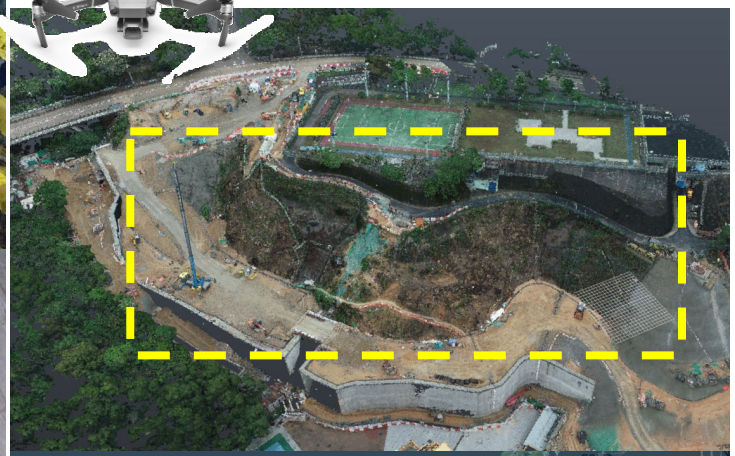
Making it Easier to Build?

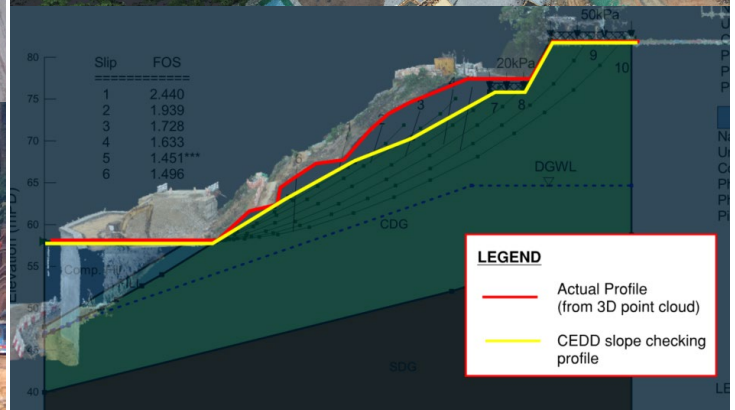


We Can Only Systemize if Permanent Works Allow

DfS on Temporary Works

火炭商廈地盤工字鐵斷裂　六旬工人被擊中飛墮4米亡



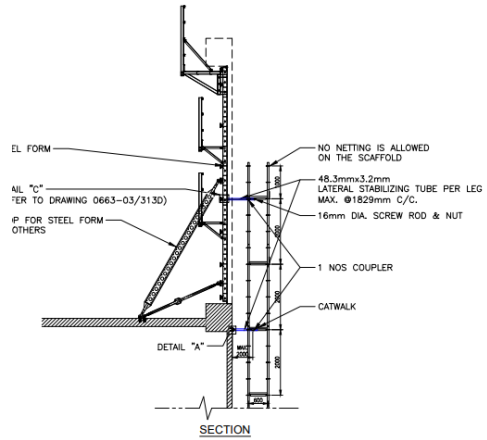


DfS on Temporary Works

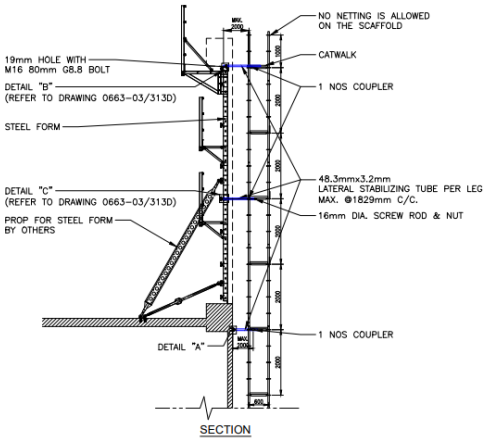
RESIDUAL RISK

OVERLAPPING TRADES – AT NO TIME SHALL WALL TIES OR INCLINED PROPS BE REMOVED.

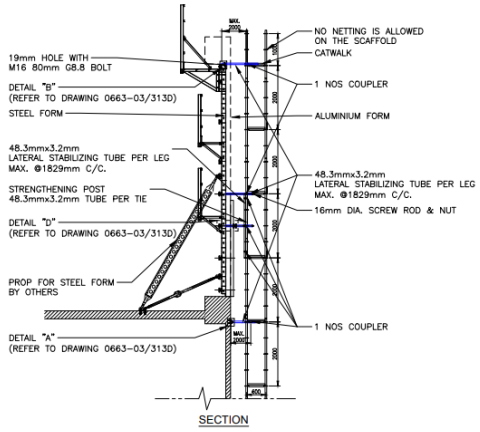
1. Erect the steel form.
2. Assemble the first 4m high working platform. Tie the working platform to the steel form with lateral stabilizing tube, screw rod and nut at 4m height.



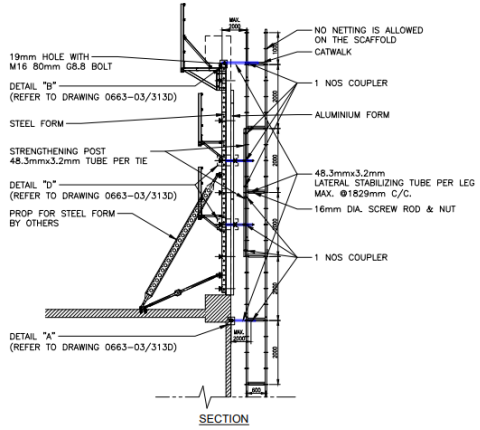
3. Assemble the 4m–8m high working platform.
4. Tie the working platform to the steel form with lateral stabilizing tube, M16 bolt at 8m height.



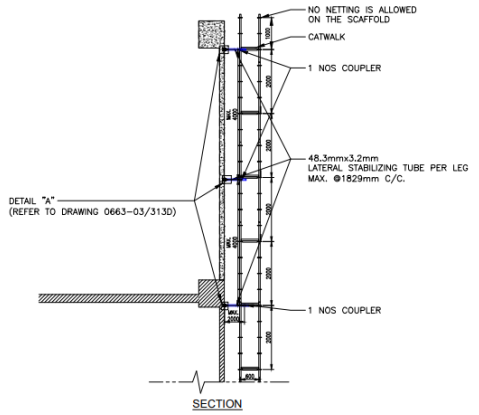
5. Erect the first 3m aluminium form, tie the working platform passing through the hole on aluminium form with lateral stabilizing tube, strengthening post, screw rod and nut at 2m heigh of the aluminium form.
6. Release the tie between the working platform and the steel form connected in step 4.



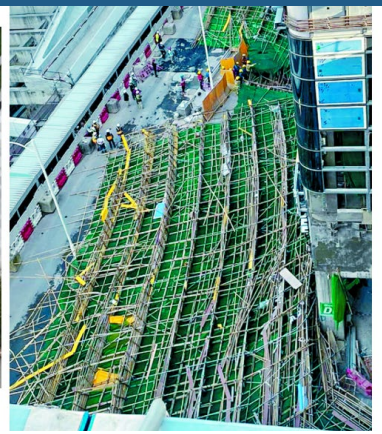
5. Erect the 3m–6.4m aluminium form.
6. Tie the working platform passing through the hole on aluminium form with lateral stabilizing tube, strengthening post, screw rod and nut at 4m height of the aluminium form.



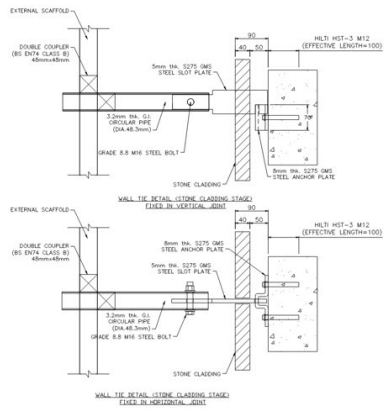
7. After concreting, tie the working platform to the new cast wall with lateral stabilizing tube, wall–tie bracket and anchor bolts.
8. Remove the forms and ties between the forms and the working platform.



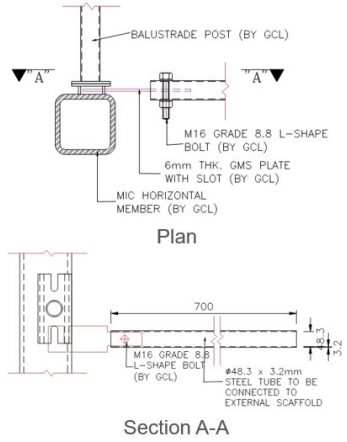
DfS on Temporary Works



FRAMING PLAN FOR 9/F-22/F (TOWER 2) FOR CURTAIN WALL STAGE

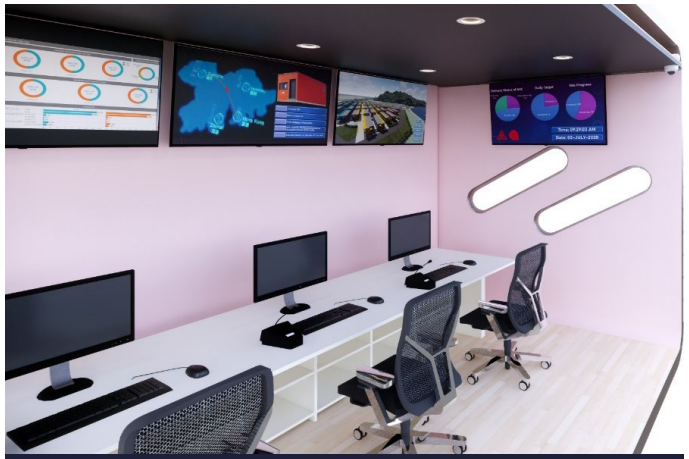


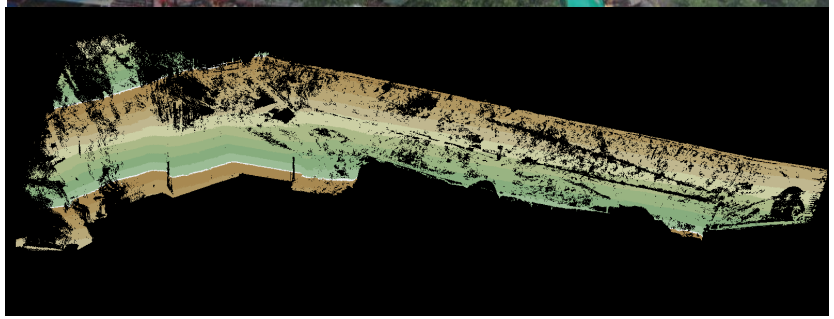
Wall Tie Details at Cladding Stage

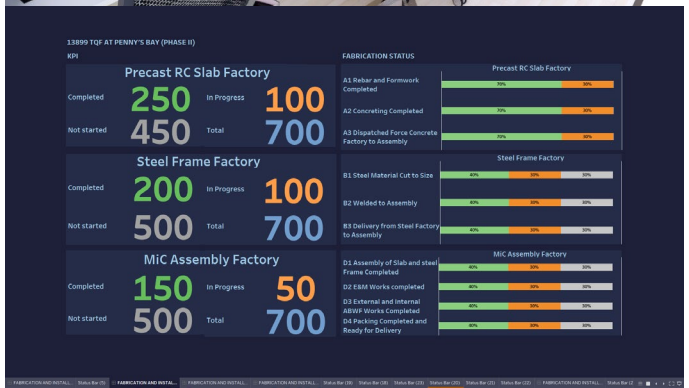


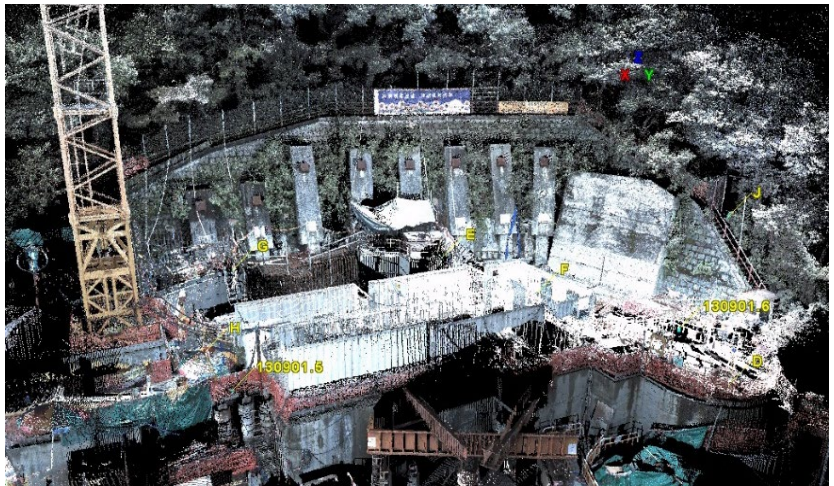
Wall Tie Details for MIC

DfS on Temporary Works – Smart Sites (Technology)



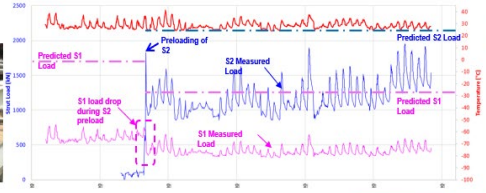






Sensor instrumentation monitoring

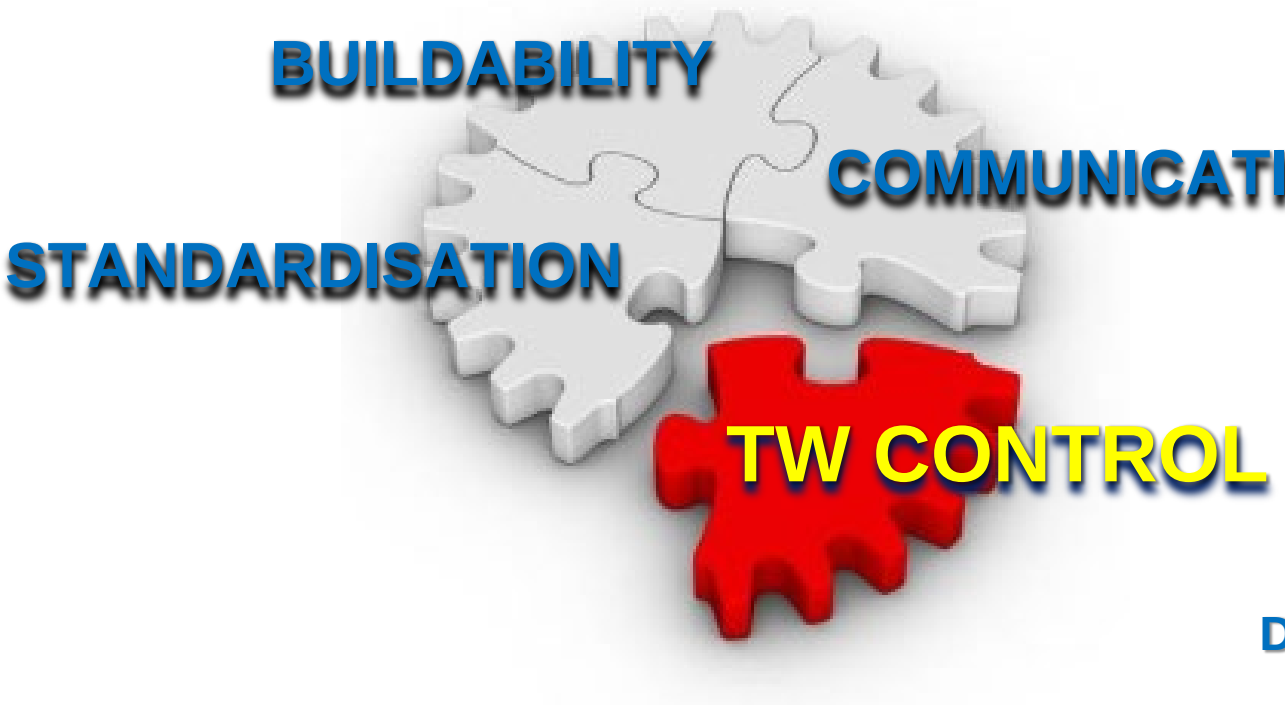
Wireless SG



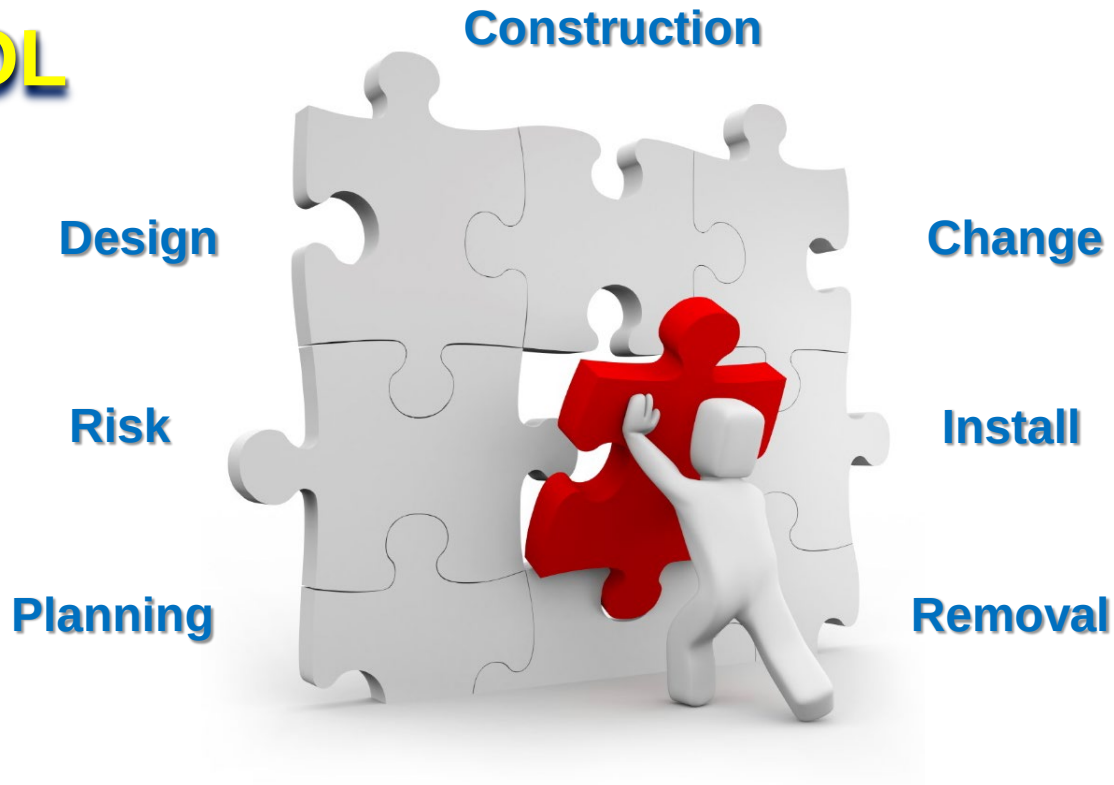
Wireless displacement sensor

Wireless tilting sensor

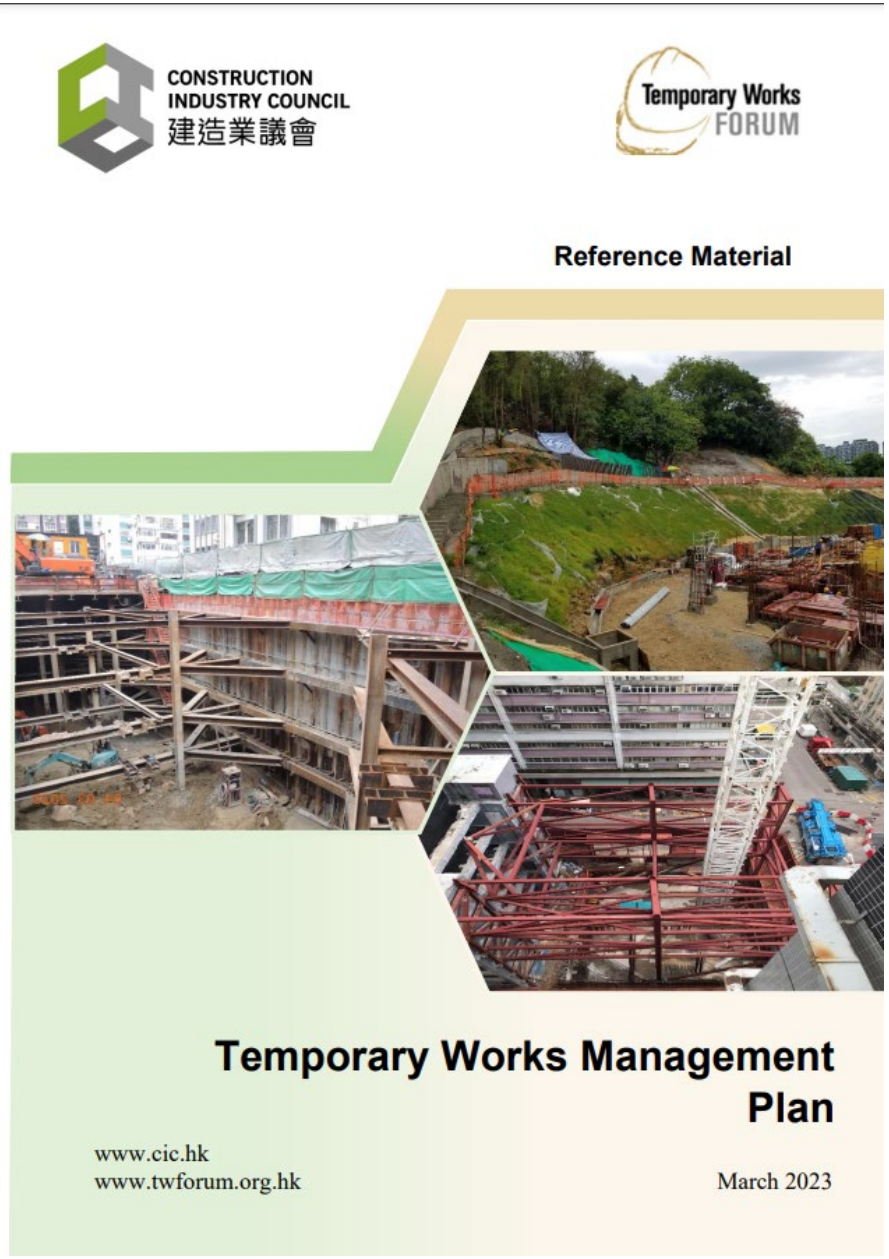
Control & Management of Temporary Works



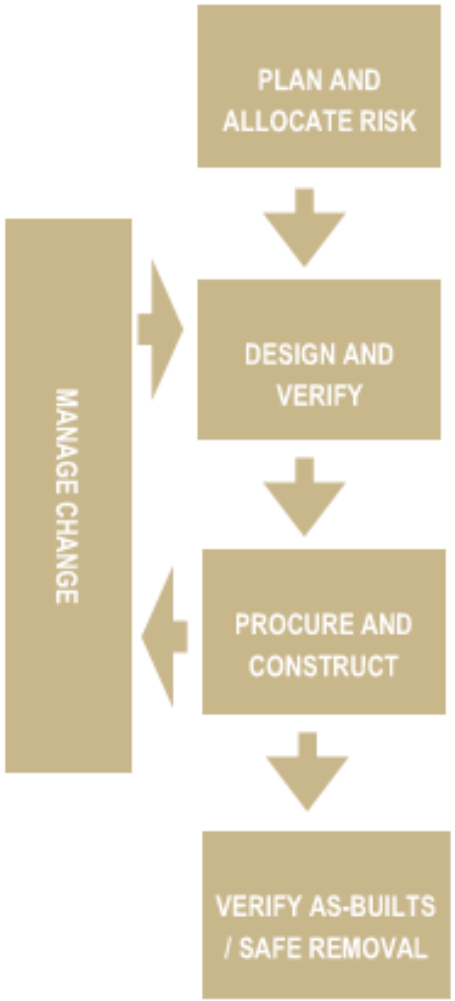
Temporary Works
Control & Management System



Temporary Works Management – A Guide to Good Practice



TW lifecycle



Key personnel

- Contractor's Representative (CR)
- TW Engineering Manager (EM)
- TW Coordinator (TWC)
- TW Designer (TWD)
- TW Supervisor (TWS)
- Independent Checking Engineer (ICE)

Control & Management of Temporary Works

TW Risk Category

Risk Category	TW Complexity	TW Designer	ICE Verification	TW Site Inspection and T4 Sign Off
A	MAJOR / COMPLEX	TWD is normally a reputable and competent engineering design consulting firm or specialist subcontractor	ICE is normally a reputable and competent engineering design consulting firm independent of TWD	TWC (and ICE - required only if specified in the contract)
B	MEDIUM			TWC
C	MINOR / SIMPLE	TWD can be a qualified engineer of appropriate stream of membership of HKIE or equivalent or a competent design engineer with relevant working experience	ICE can be a registered professional engineer (civil, structural or geotechnical as appropriate) with relevant working experience independent of TWD	TWC

TABLE B2 – Risk Category Typical Examples

Typical TW	Examples		
	Risk Category A	Risk Category B	Risk Category C
	MAJOR / COMPLEX	MEDIUM	MINOR / SIMPLE
General	• Tower crane bases and other support (e.g. wall ties) • Propping of existing structures • Bridge erection schemes • Batching Plant • Any works adjacent to operational railways	• Warehouses / sheds • Temporary site compound facilities • Noise enclosures / Temporary roofs	• Reinforcement stability checks • Minor temporary site compound facilities
Falsework / Formwork	• Complex falseworks systems or any proprietary falsework system > 20m high • Falsework supporting inclined loads • Mechanised formwork systems • Single sided formwork > 6m high • Inclined formwork systems (except minor stairs/cranked beams) • Suspnded scaffolds / platforms	• Any proprietary falsework system 10m-20m high (or >2 storeys) • Any proprietary falsework system supporting > 1.4m thick slab • Scaffold supporting loading platforms (>5kPa) • Working platform (>5kPa) • Cantilever scaffold (>0.9m) and 'bridge over' scaffolds > 3m using proprietary system • Double sided formwork > 3m high • Single sided formwork 3-6m high • Column forms > 10m high • Complex back-propping systems	• Any proprietary falsework system < 10m high (or 2 storeys) • Table forms or repetitive formwork systems • Scaffold supporting loading platforms (>1.5kPa and < 5kPa) • General duty working platform (>1.5kPa and < 5kPa) • 'Bridge over' scaffolds using proprietary system < 3m • Column forms < 10m high • Double sided formwork > 0.4m and < 3m high • Single sided formwork > 0.4m and < 3m high • Scaffolding access on slopes • Weather retaining scaffold structure or subject to high wind loads • Simple back-propping systems
Platforms / Ramps / Covers	• Traffic Decks and vehicle parapets • Working platforms for plant / cranes / piling rigs • Barging points / Marine loading ramps • Steelwork platforms supporting mobile / crawler cranes • Temporary steelwork structures over public areas	• Earth platforms and ramps (on sloping sites) for construction traffic or crawler crane	• Small span platforms with light loading • Drilling rig shallow platforms • Covers to protect utilities / openings • Earth platforms for cranes < 120T
Excavation and Lateral Support	• Ground support schemes > 4.5m deep • Strutted excavations > 4.5m deep • Excavations with complex strutting schemes • Excavations adjacent to sensitive structures • Excavations with strutting imposing high loads on other structures	• Ground support schemes 2m – 4.5m deep • Strutted excavations 2m – 4.5m deep • Open cut excavations > 4.5m deep • Major temporary support to utilities suspended over excavations	• Ground support schemes < 2m deep • Strutted excavations <2m deep • Open cut excavations 1.2m - 4.5m deep • (Open cut < 1.2m are exempt unless adjacent to slope or sensitive receivers) • Vertical blinding < 3m deep • Minor temporary support to utilities suspended over excavations
Geotechnical	• Deep dewatering and re-charge schemes • Loading on existing sea walls • Ground improvement schemes • Pipe jacking	• Pump test design reviews • Pile load tests • Ground support for mobile crane outriggers	• Earth haul roads / platforms < 3m high
Hoardings / Fences / Barriers	• Catch fans over public areas • Catch fans adjacent to operational railways • Vehicle parapets	• Hoardings / fences > 3m high • Catch fans over site area	• Hoardings / fences < 3m high • Internal hoardings / partitions • Non-proprietary edge protection systems / fences / gates
Lifting / Falling Objects	• Heaving lifting and hoisting schemes > 25T • Jacking or underpinning schemes	• Temporary lifting and hoisting systems (5-25T) • Man cages / general lifting receptacles / cages • Hoists • Complex lifting frame with complex CoG • Complex lifeline systems	• Temporary lifting and hoisting systems (<5T) • Simple life line systems • Scaffolding / tower lifting
Mechanical Works	• Temporary Ventilation Systems	• Support frames for E&M equipment lifts	• Temporary drainage systems and diversions • Temporary support of miscellaneous temp. E&M equipment (<1T)

Control & Management of Temporary Works

TW Control Document

T1 MASTER SCHEDULE

Job No.: J584 | Project: Contract No. MRE855, Mountain Rail Extension, Peak Station and Eastern Approach Tunnels

T1 Package No.	TW Package Description	TW Risk Cat	TWD	ICE	TWC / TWCM	TWS	Date Design Required	Related T2	Related T3	Related T4
A	Contract Wide TW Packages									
A01	TW Geological Drawings	A	Consultan t 1	ICE 1	Cecilia Singh	Paul Green	-	n/a	-	-
A02	Contract Wide ELS General Notes & Details	A	Consultan t 1	ICE 1	Adam Ho	-	-	n/a	T3-0008	-
A03	Instrumenta									
B	Site Establ									
B01	Works Area									
B02	Project Site									
B03	Hoarding /									
B04	Project Sig									
C	Station									
C01	ELS & Stru									
C02	ELS & Stru									
C03	Constructio									
C04	Temporary									
C05	Settlement									
C06	Formwork									
C07	Steel Shuff									
C08	Formwork									
C09	Formwork									
D	Approach T									
D01	Demolition									
D02	Temporary Road Flyo									
D03	D-Wall Gui									
D04	ELS & Stru									
D05	ELS – Shaf									
D06	ELS – Box									
D07	Traffic Dec									
D08	Constructio									
D09	Formwork									
D10	Formwork									
E	Traffic									
E01	TTM1 – Ha									
E02	TTM2A – S									
E03	TTM2B – S									
E02	TTM3 – Bo									
E04	TTM4 – Ex									

T2 DESIGN BRIEF

Job No.: J584 | Project: Contract No. MRE855, Mountain Rail Extension, Peak Station and Eastern Approach Tunnels

T1 Ref.No.	D06	Design Package	ELS – Box Culvert Diversion	Design Brief No.	T2-0014

Brief Description of the Works to be Designed:

- Plea
- chan
-
-
-
-

Information Attached to Facilitate the Design:

A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	

NOTE

Initiated by TWS

Temporary Works Risk Category: A / B / C

Reviewed and Issued by TWC

Received and acknowledged by TWD

T3 DESIGN CHANGE

Job No.: J584 | Project: Contract No. MRE855, Mountain Rail Extension, Peak Station and Eastern Approach Tunnels

T1 Ref.No.	D06	Design Package	ELS – Box Culvert Diversion	Change No.	T3-0016

Location: TTM2 Stage B at Site Area WA6a

RELEASED FOR CONSTRUCTION 批准作建造用途
T1 No.: D06 Risk Cat. 風險類別: B
(signature) TWC: Tom West Date: 20/9/2017

Element of Works: Strut Layer 2 Knee Brace

Details of Proposed Change: Due to the change in TTM2 Stage A and B, the extent of temporary Box Culvert Diversion completed during Stage A now clashes with the Stage B knee brace. The designer is requested to adjust the knee brace to avoid clash with completed Stage A temp culvert diversion structure

Design Drawings Affected — Drawings / Sketches Released for Construction:

Drawing / Sketch No.	Rev	Drawing / Sketch No.	Rev
MRE855/EAT/CON2/TW/3001	C		
MRE855/EAT/CON2/TW/3004	A		

Initiated by TWS or TWD	Temp Works Supervisor or Designer	Signature	Date
	Rachel Wong		11 Sep 2017

T3 Risk Category: A ☐ / B ☒ / C ☐ — Reason for Change: Obstruction caused by completed temp culvert structure during TTM2 Stage A

Change to be endorsed by	TWD	☒	ICE	☒	Required design delivery date	18 Sep 2017

Issued by TWC	Temporary Works Coordinator	Signature	Date
	Tom West		13 Sep 2017

Reviewed / Approved by TWD: Approved ☒ / Rejected ☐ — Designer's Remarks (if any): Checked and found satisfactory.

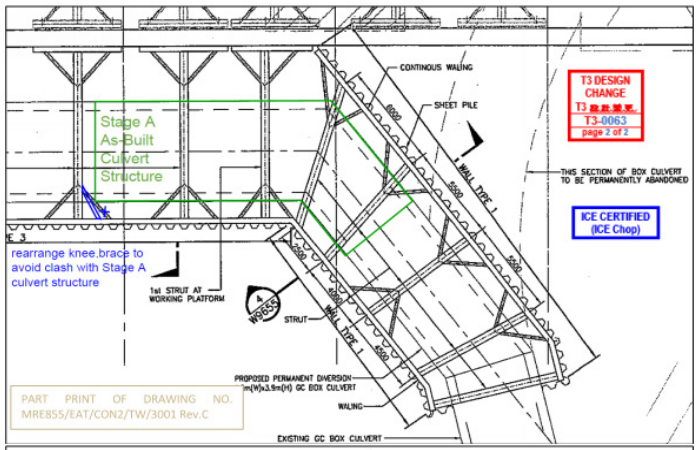
Change Agreed by TWD	Temporary Works Designer	Signature	Date
	James Chan (Consultant 2)		18 Sep 2017

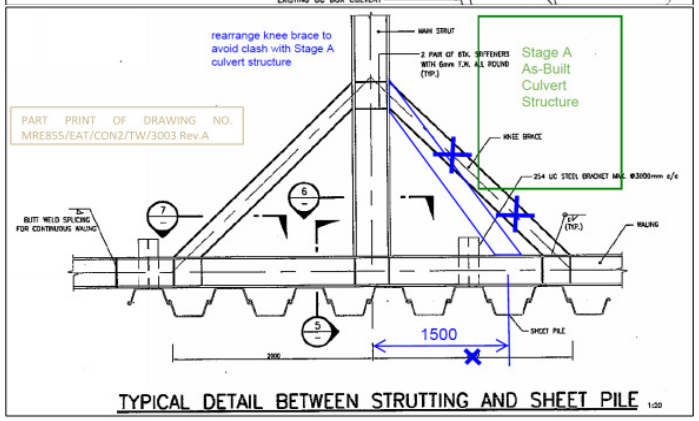
Reviewed / Approved by ICE: Approved ☒ / Rejected ☐ — ICE's Remarks (if any): The proposed change is found satisfactory. ICE CERTIFIED (ICE Chop)

Change Certified by ICE	Independent Checking Engineer	Signature	Date
	William Tsang (ICE1)		19 Sep 2017

T3 DESIGN CHANGE

Job No.: J584 | Project: Contract No. MRE855, Mountain Rail Extension, Peak Station and Eastern Approach Tunnels





T4 PERMIT TO LOAD / REMOVE

Job No.: J584 | Project: Contract No. MRE855, Mountain Rail Extension, Peak Station and Eastern Approach Tunnels

T1 Ref.No.	C03	Design Package	Construction Decking - Station	Permit No.	T4-0020

Location: Construction Decking – Station

Element of Works: Construction Deck B at Eastern Portion of WA6a

Extent of Operation and Construction Activity: Partially completed construction deck B as demarcated in the attached markup plan.

Constructed in accordance with documents:

Drawings / Sketches Released for Construction:

Drawing / Sketch No.	Rev	Drawing / Sketch No.	Rev
MRE855/EAT/CON1/TW/6101	C		
MRE855/EAT/CON1/TW/6111	B		
MRE855/EAT/CON1/TW/6112	C		
MRE855/EAT/CON1/TW/6121	A		
MRE855/EAT/CON1/TW/6122	A		

T3 Design Changes:

T3 No.	T3 No.	T3 No.	T3 No.
T3-0014			
T3-0019			

Other Reference Documents: Construction Method Statement for Construction Decking (Station)

Permit to Load Initiated by TWS — The above temporary works have been checked by me and as far as I can ascertain they are in accordance with the documents listed above.

Temp Works Supervisor	Signature	Date
James Steel		28 Sep 2017

Permit to Remove Initiated by TWS (if required) — Permit to Remove Required? Yes ☐ No ☒

NOTE: Required only if the Temporary Works are still loaded during removal.

The above temporary works have been checked by me and may be safely removed.

Temp Works Supervisor	Signature	Date

Permit to Load endorsed by TWC / TWCM — TWC remarks (if any): Checked and found satisfactory. Permit Valid Until Date: n/a

The above temporary works have been checked by me and as far as I can ascertain they are in accordance with the documents listed above.

Temporary Works Coordinator	Signature	Date
Adam Ho		2 Oct 2017

Permit to Remove endorsed by TWC / TWCM (if required) — The above temporary works have been checked by me and may be safely removed.

Temporary Works Coordinator	Signature	Date

Permit to Load Certified by ICE (Risk Cat A only) — ICE remarks (if any): Checked and found satisfactory. ICE CERTIFIED (ICE Chop)

The above temporary works have been checked by me and as far as I can ascertain they are in accordance with the documents listed above.

Independent Checking Engineer	Signature	Date
William Tsang (ICE1)		2 Oct 2017

Temporary Works e-Training

Temporary Works e-Training

Temporary Works Overview

Level 1

Temporary Works e-Training – Level 1 – TW Overview

CONSTRUCTION INDUSTRY COUNCIL 建造業議會

Click to gain a high level understanding of each of the key roles defined in the TWMP procedure

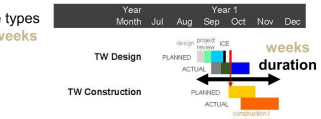
If you are appointed into any of these roles you should read and understand the TWMP procedure to have more detailed understanding of your responsibilities and the responsibilities of others under the procedure

Temporary Works e-Training – Level 2A – People + Responsibilities


formwork


falsework

The lifecycle duration for some types of TW may only span several weeks



TW Lifecycle Planning & Design


working deck


ELS cofferdam

... whilst other types of TW can span months or even years

Common problems :

- TWMP procedure actions not taken at the right timing expected under the TWMP procedure
- Individuals focus on short term day to day goals losing sight of the long term TW objectives
- insufficient time increases the likelihood of mistakes and shortcuts in TW decision making

Temporary Works e-Training – Level 2B – TW Lifecycle Planning & Design

Proper discharge of the duties of a TWS or TWC under the TWMP Procedure is challenging.

All TWSs & TWCs require adequate recognition, training and support to properly carry out their duties.

If you are a CR or EM, are you actively supporting your TWSs and TWCs to do the right thing in accordance with the TWMP Procedure?

TWSs and TWCs are subjected to pressure to:

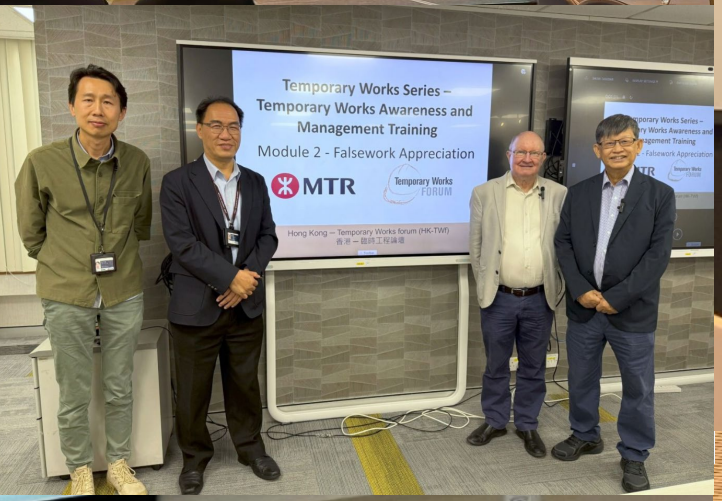
- turn a blind eye
- back down from doing what is right
- avoid pointing out potential risks

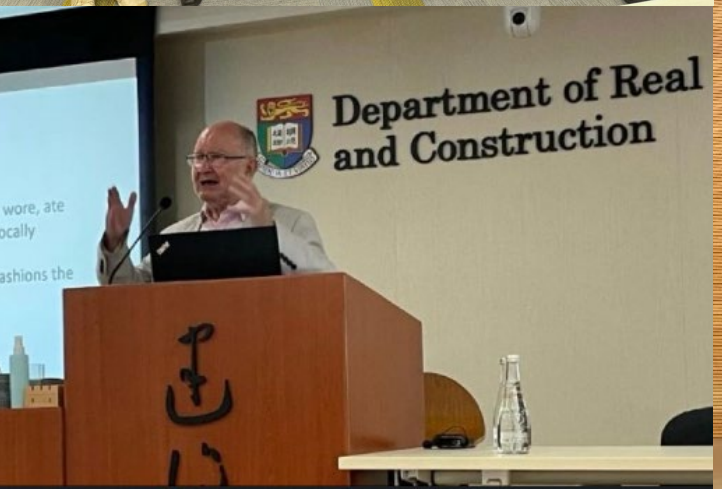
TWSs and TWCs cannot be expected to stand up to these pressures on their own. They need the technical & authoritative support of their senior management, especially the CR and EMs.

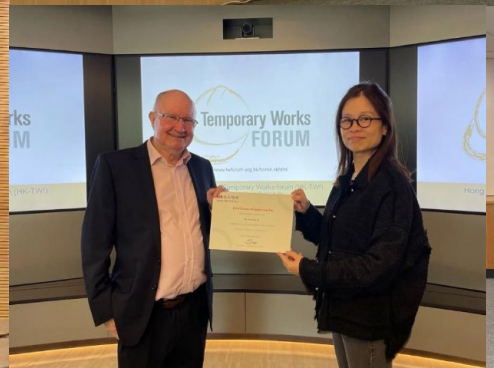
To illustrate the types of pressures TWSs & TWCs are subjected to, please read and see what actions you would take in the following case study.

Temporary Works e-Training – Level 2C – TW Construction and Change

Industry Sharing







Temporary Works Outcomes

Temporary Works outcomes are within our control

http://www.twforum.org.hk

Temporary Works Forum Hong Kong
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